



## GROOVED BRUSH BRISTLE

### CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of application Serial Number 08/654,541 filed June 4, 1996, for the Twist Bristle Toothbrush and application Serial Number 09/190,275 filed November 13, 1998, for Grooved Bristle for Brush Devices, now abandoned.

### BACKGROUND OF THE INVENTION

This invention relates to an improved bristle for use in toothbrushes. The bristle of this invention has a groove along its longitudinal surface area, commonly called the shaft of the bristle. In practice, on account of the groove in the shaft, the entire bristle, including the tip and the shaft function as the cleaning surface of the bristle. Consequently, the entire surface area of the bristle is utilized for cleaning.

Gum disease, periodontics, continues to affect large sections of the population and is the major cause of tooth decay among adults. Studies show that after age thirty-five (35), approximately seventy-five (75) percent of all adults suffer from periodontal disease in one form or another. Although periodontal disease is generally referred to as a single disease, it actually occurs in several forms. Regardless of the form it takes, however, all periodontal diseases are caused by bacterial infections which

first manifest themselves as an inflammation of the gums.

In its early stages, periodontal disease usually affects the color and shape of the gums. If the disease is not checked at this stage it can progress to the point of completely destroying the bony tissue in which the teeth are anchored. The cause of the disease is the presence of plaque, a colorless bacterial film which instantly forms on teeth and gums. To combat plaque formation, it is generally recommended that the teeth and gums must be brushed at least two (2) times daily, even so, plaque formation still continues to be a problem. The Grooved Bristle will improve and increase the quantity of plaque removed from the teeth and gums, retard plaque formation, result in healthier teeth and gums and better oral hygiene.

It is well accepted that in conventional toothbrushes the major cleaning function is carried out by the tips of the bristles. The smooth shaft of the conventional toothbrush bristle is not designed or intended to be a part of the cleaning process. For example, in toothbrushes, most of the cleaning is done by the tip end of the bristle, the smooth and rounded shaft of the bristle plays an insignificant role in the cleaning process. The function of the shaft is even less effective when it comes to removal of plaque from the teeth and gums.

In the present invention, the tips of the bristles continue to be the primary cleaning area of the brush, however, the shaft of

the bristle has been adapted so that it too becomes a part of the cleaning process. The use of the shaft as part of the cleaning process is achieved by placing one or more grooves on the shaft of the bristle thereby giving it the ability to scrape and clean the teeth and gums when the shaft passes against the teeth while in the process of brushing one's teeth.

### SUMMARY OF THE INVENTION

This invention is based on the scientific fact that when vertical pressure is exerted on the tip of a round bar or rod of metal or plastic, the bar or rod will bend or twist in response to the application of the pressure. It is also well known that if vertical pressure is applied to a cylindrical rod which has a longitudinal groove, it will take less vertical pressure to cause the grooved rod to bend or twist angularly to accommodate the vertical pressure than a solid rod.

The foregoing principle which is applicable to the cylindrical rod is also applicable to a thin rounded plastic bristle which has one or more grooves, along its longitudinal axis. When vertical pressure is applied to this bristle it bends, however because the base of this bristle is fixed in place and can not rotate a full 360 degree rotation like the mechanical drill, the bristle will only twist to a degree of approximately 30 to 90 degrees and will twist back and forth on its axis in a motion similar to the

agitator of a washing machine.

In order to be effective as a cleanser, the bristle must be capable of maintaining a free standing erect position on the head or body of the brush such that it will only bend or twist upon the application of slight pressure upon the tip of the bristle.

The cleansing power of a brush which utilizes the bristle of this invention is created by the application of pressure on the tip of the bristle while simultaneously making a brushing motion to cause the bristle to make a vibratory motion against the surface to be cleaned. The application of the vertical pressure to the bristle coupled with a the back and forth motion will cause the tip of the bristle to twist and to sway backwards and forwards and produce the desired vibratory motion.

With respect to the use of the bristle of this invention in toothbrushes, the back and forth agitating action of the bristle generates fluid cross currents in the saliva which works its way around and between the teeth. The flow of saliva washes the teeth and gums and removes food particles and other undesirable objects, including plaque, from around and between the teeth and gums. The grooves on the bristle also act as conduits for the removal of the plaque and other waste products from around the teeth and gums.

Toothbrushes which utilize the grooved bristle of this invention are very effective in removing plaque and cleansing the teeth. They provide the same general cleansing power as electric

or battery powered rotating bristles and have the advantage over the powered brushes that they do not pose a risk of causing damage to the gums due to excessive abrasion and do not present a threat of electrocution. In addition, the grooved bristle toothbrush does not pose the problems caused by the vibrations of ultrasonic toothbrushes which create a risk of causing damage to the tissue in the users mouth.

The bristle of this invention greatly increases the cleaning power of the toothbrush, shortens the cleaning time, does not increase abrasion, is tissue safe and inexpensive. In addition, the invention produces an improved bristle for use in cleaning brushes of many different varieties.

In accordance with the invention, the longitudinal axis or shaft of the bristle is marked with at least one or more grooves. These grooves may be vertical or they may run spirally in a clockwise or counterclockwise direction on an individual bristle. However, the grooves cannot be vertical and spiral clockwise or counterclockwise on the same bristle.

During brushing of the teeth, the pressure on the tip of the bristles, the presence of the groove on the bristle, the back and forth motion of brushing causes the bristles to twist, bend, and rotate back and forth, thereby producing cross currents in the saliva in the mouth. The activation of the saliva in and around the teeth and gums enhances the cleaning function of the

toothbrush.

The improved cleaning achieved through the use of the bristle of this toothbrush occurs as a result of the back and forth motion of the toothbrush causing saliva to enter the sulcus and create secondary cross currents to rinse the sulcus, resulting in more effective cleaning of the teeth and gums, healthier teeth and gums and fresher breath.

Accordingly, a primary object of this invention is to produce an improved bristle for toothbrushes which is inexpensive, tissue safe and has enhanced cleaning abilities and which utilizes proven oral hygiene principles to prevent periodontal disease, gingivitis and tooth decay.

It is a further object of this invention to produce a toothbrush in which the shaft of each individual bristle includes one or more grooves along its longitudinal axis which enhances the abrasiveness of the bristle, expands the surface area of the bristle used in cleaning and improves the cleaning of the teeth below the gum line.

Another object of the invention is to produce a bristle which when used with a back and forth brushing motion, bends, twists or rotates to create a flow of cross currents in the saliva for the purpose of rinsing the teeth and gums.

Yet another object of the invention is to produce a toothbrush which creates a cross current of saliva flow between and around the

teeth and gums to remove subgingival plaque.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 is a lateral cross sectional view of a toothbrush showing the arrangement of the bristles on the head of a typical brush.

Figure 2 is a vertical cross-sectional view of a toothbrush showing tufts of bristles embedded in the head of the toothbrush.

Figure 2A is an end view of a toothbrush showing tufts of bristles.

Figure 3 is a vertical view of a toothbrush showing the tufts (4) of bristles on the head of the brush.

Figure 4 is vertical view of an individual bristle showing the symmetrical positioning of the spiral grooves on the surface of the bristle.

Figure 4A is a vertical view of an individual bristle showing a vertical groove.

Figure 5 is a cross-sectional view of an individual bristle at the position 5-5 showing the size of the grooves of the bristle in relation to the cross-sectional diameter of the bristle. In the drawing, "r1" represents the radius of the bristle and "R2" the radius of the spiral groove, "d1" represents the diameter of the bristle and "D2" the diameter of the spiral groove.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

With particular reference to the drawings, toothbrush bristles are used to illustrate the bristle structure of the instant invention. Although the bristle and brush construction herein illustrated are in association with a toothbrush and have special application to such a brush, it is to be understood that the concept may be used with almost any type of brush and is not limited to use in the construction of toothbrushes.

As shown in Figures 1, 2, 2A and 3, generally, the individual bristles 14 are mounted in tufts 11 and embedded in a base (head) 10, which is attached to a manual or power activated handle. In practice the arrangement of the bristle into tufts on the base is important to the achievement of enhanced cleansing power of the brush. Specifically, all of the bristles in a single tuft of bristles must be vertical or run clockwise or counterclockwise, i.e. the grooves on the longitudinal axis of the bristle cannot be mixed so that one groove will be vertical and another clockwise or counterclockwise.

On the other hand, the arrangement of the tufts on the head of an individual toothbrush does not have to be uniform. For example, an individual toothbrush manufacturer may decide that for purposes of practice or convenience, it may be preferable to have alternating rows of tufts of bristles organized in vertical, clockwise or counterclockwise form, or the tufts may be organised



in a random arrangement selected by the manufacturer.

Figure 4, shows an individual bristle with a spiral groove forming a helix shaped pattern along the outside surface of the shaft of the bristle, the groove extends continuously from the stem of the bristle which is embedded in the toothbrush head, to the tip of the bristle.

Figure 4A shows an individual bristle with a vertical groove which extends from the base to the tip of the bristle.

It should also be noted that the grooves and the individual bristles are of uniform diameter throughout the length of the shaft. The relationship of the diameter of each bristle to the diameter of the groove is approximately 4:1 i.e. the diameter of each groove is approximately one fourth of the diameter of each bristle. The cross-sectional diameter of each spiral groove is ten to fifteen percent of the cross sectional diameter of each bristle.

For the purposes of this invention, the tips of the individual bristles may be round, square or shaped in any other form suitable or appropriate for the invention. The shaft of the bristle is unbroken and of uniform cross-sectional diameter and circumference except in the region of the grooves. In addition, further reference to figures 4 and 5 shows that there may be more than one groove on each bristle.

In practice, the cleaning effect of the brush is accomplished by virtue of the simultaneous action of the individual bristles

which are put into their own rotational motion by the back and forth vibratory action when the user brushes his teeth. The force generated by the action of numerous bristles produces liquid currents in the saliva which can dislodge particles trapped between and around the teeth and gums and improve the cleaning of the teeth, the removal of plaque and the prevention of plaque formation.

The grooved bristle of this invention has been particularly described as being symmetrical through its length, however, the invention may also use non-symmetrical or tapered bristles having other shapes or structures as may be desired.

**What I claimed is:**

Claim 1. A bristle having a base end, and a tip end connected to each other by means of a substantially rigid shaft portion wherein said base end is fixedly placed on the base portion of a brush device and wherein said substantially rigid shaft has at least one groove along its longitudinal axis and wherein said substantially rigid shaft maintains said bristle in a free-standing upright erect position on the base portion of said brush device but wherein said shaft is sufficiently flexible so that said bristle will twist, bend and rotate on its axis when slight vertical and horizontal pressures are applied to the tip end of said bristle during brushing or cleaning and such that the twisting, bending and